

We Claim:

1 1. An apparatus comprising:
2 a capillary support for holding a capillary;
3 a capillary rotator that adjusts an orientation of an opening within the capillary; and
4 an optical fiber rotator that adjusts a polarization of a first optical fiber and a second
5 optical fiber when the fibers are adjacently disposed within the capillary.

1 2. The apparatus of claim 1 further comprising a removable funnel having an opening
2 positioned adjacent to the capillary opening.

1 3. The apparatus of claim 2 wherein the capillary opening is wider at an insertion end of
2 the capillary to form a capillary funnel opening and the removable funnel has a first opening
3 similar in size to the capillary funnel opening and a second opening which is substantially
4 larger than the capillary funnel opening..

1 4. The apparatus of claim 3 further comprising a support structure which has at least one
2 rail slidably coupled to the capillary support and at least one rail slidably coupled to the
3 removable funnel, wherein the rails are positioned to ensure that the capillary funnel opening
4 is aligned with the first opening in the removable funnel when the capillary is secured to the
5 capillary support.

1 5. The apparatus of claim 1 wherein the capillary rotator includes:
2 a main body positioned adjacent to the capillary support; and
3 a first and second roller connected to the main body, the rollers to removably engage
4 the capillary to rotate the capillary.

1 6. The apparatus of claim 5 wherein the capillary rotator further includes a first elastic
2 material to bias the rollers towards the capillary such that the rollers apply a normal force to
3 the capillary.

1 7. The apparatus of claim 6 wherein the capillary rotator further includes a second elastic
2 material coupling the first roller to the second roller such that a rotation of one of the rollers
3 causes the other roller to rotate and the rotation of the rollers causes the capillary to rotate
4 about its center of axis when the rollers are engaged with the capillary.

1 8. The apparatus of claim 2 wherein the optical fiber rotator includes:
2 an optical fiber rotator knob removably mounted adjacent to the first optical fiber; and
3 a optical fiber rotator shaft connected to the knob, the shaft and the knob having an
4 opening to accept the first optical fiber such that the first optical fiber is concentric with the
5 knob and rotation of the knob causes the first optical fiber to rotate about its center of axis.

1 9. The apparatus of claim 8 wherein the knob has a first knob portion and a second knob
2 portion connected by a connector to allow the knob to be positioned in an opened position or a
3 closed position, wherein a device releasably secures the knob in the closed position and the
4 first knob portion includes a compression element to secure the first optical fiber to the knob
5 opening when the knob is in the closed position.

1 10. The apparatus of claim 9 wherein the shaft opening and the knob opening are v-
2 grooves.

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1 11. An apparatus comprising:

2 a capillary having an opening of a dimension for accommodating a first polarization
3 maintaining optical fiber and a second polarization maintaining optical fiber;

4 a clamp to provide a clamping force to the capillary to removably couple the capillary
5 to the clamp;

6 a main body positioned adjacent to the clamp;

7 a first and a second roller, connected to the main body, to removably engage the
8 capillary to rotate the capillary, the main body and the rollers comprising an optical fiber
9 capillary rotator; and

10 a polarization maintaining optical fiber rotator knob having a shaft, wherein the knob
11 and shaft each have an opening to accept the first fiber such that the first fiber is concentric
12 with the knob and rotation of the knob causes the first fiber to rotate about its center of axis,
13 the knob and shaft comprising a polarization maintaining optical fiber rotator which is
14 mounted adjacent to the first fiber.

1 12. The apparatus of claim 11 further comprising a removable funnel, wherein the
2 capillary opening is wider at an insertion end of the capillary to form a capillary funnel
3 opening and the removable funnel has a first opening similar in size to the capillary funnel
4 opening and a second opening which is substantially larger than the capillary funnel opening,
5 the removable funnel first opening being positioned adjacent to the capillary funnel opening
6 when the capillary is coupled to the clamp.

1 13. The apparatus of claim 12 further comprising a support structure which has at least
2 one rail slidably coupled to the clamp and at least one rail slidably coupled to the removable
3 funnel, wherein the rails are positioned to ensure that the capillary funnel opening is aligned
4 with the removable funnel first opening when the capillary is coupled to the clamp.

1 14. The apparatus of claim 11 wherein the capillary rotator further includes:
2 a first elastic material to bias the rollers towards the capillary such that the rollers
3 apply a normal force to the capillary; and
4 a second elastic material coupling the first roller to the second roller such that a
5 rotation of one of the rollers causes the other roller to rotate and the rotation of the rollers
6 causes the capillary to rotate about its center of axis when the rollers are engaged with the
7 capillary.

1 15. The apparatus of claim 11 wherein the knob has a first knob portion and a second
2 knob portion connected by a connector to allow the knob to be positioned in an opened
3 position or a closed position, wherein a device releasably secures the knob in the closed
4 position and the first knob portion includes a compression element to secure the first fiber to
5 the knob opening when the knob is in the closed position, and wherein the shaft opening and
6 the knob opening are v-grooves.

1 16. A method comprising:
2 securing a capillary to a capillary support;
3 rotating the capillary by use of a capillary rotator such that an opening in the capillary
4 is positioned in a selected orientation;
5 inserting a first and a second optical fiber into the opening in the capillary such that
6 the first and second fibers are adjacently positioned; and
7 rotating the first optical fiber by use of a optical fiber rotator assembly such that the
8 first and second fibers have a selected polarization.

1 17. The method of claim 16 further comprising positioning a removable funnel adjacent to
2 the capillary when the capillary is secured within the capillary support.

1 18. The method of claim 17 wherein positioning the removable funnel adjacent to the
2 capillary includes aligning a first opening in the removable funnel with the capillary opening.

4 positioning the removable funnel adjacent to the capillary includes securing the
5 removable funnel to the support structure.

20. The method of claim 18 wherein securing the capillary to the capillary support includes rotating a double threaded screw which engages a first capillary support arm and a second capillary support arm such that rotation of the double threaded screw causes the first capillary support arm to move in an opposite direction with respect to the second capillary support arm, and wherein a first funnel portion is secured to a second funnel portion by rotating a double threaded screw which engages a first funnel portion and a second funnel portion and causes the first funnel portion to move in an opposite direction with respect to the second funnel portion.

21. The method of claim 16 wherein rotating the capillary includes rotating a first or second roller of the capillary rotator such that rotation of one of the rollers causes rotation of the other roller, and the rotation of the rollers causes the capillary to rotate.

1 22. The method of claim 16 wherein rotating the first optical fiber includes:
2 inserting the first optical fiber into an optical fiber rotator, the fiber rotator having a
3 optical fiber rotator knob;
4 positioning the first optical fiber concentric with the knob; and
5 rotating the knob such that the first optical fiber rotates about its center of axis.

1 23. The method of claim 22 wherein rotating the first optical fiber includes:
2 separating a first knob portion from a second knob portion;
3 inserting the first optical fiber into an opening in the knob; and
4 securing the first optical fiber between the first and second knob portions.

1 24. The method of claim 23 further including affixing the first and second fibers to the
2 capillary opening after the first and second fibers have been positioned in the selected
3 polarization.

1 25. A method comprising:
2 securing a capillary to a clamp;
3 engaging the capillary with a capillary rotator;
4 rotating the capillary by use of the capillary rotator such that an opening in the
5 capillary is positioned in a selected orientation;
6 inserting a first optical fiber and a second optical fiber into the opening in the
7 capillary such that the first and second fibers are adjacently positioned;
8 inserting the first fiber into a optical fiber rotator;
9 positioning the first fiber concentric with the optical fiber rotator; and
10 rotating the optical fiber rotator such that the first and second fibers have a selected
11 polarization.

1 26. The method of claim 25 further comprising positioning a removable funnel
2 adjacent to the capillary when the capillary is secured within the clamp.

1 27. The method of claim 26 wherein positioning the removable funnel adjacent to the
2 capillary includes aligning a first opening in the removable funnel with the capillary
3 opening.

1 28. The method of claim 27 wherein:
2 securing the capillary to the clamp includes securing the clamp to a support
3 structure, wherein the support structure has at least one rail slidably coupled to the clamp;
4 and
5 positioning the removable funnel adjacent to the capillary includes securing the
6 removable funnel to the support structure, wherein the support structure has at least one
7 rail slidably coupled to the removable funnel.

1 29. The method of claim 25 wherein inserting the first fiber into the optical fiber
2 rotator further includes:
3 separating an optical fiber rotator first knob portion from an optical fiber rotator
4 second knob portion;
5 inserting the first fiber into an opening in the knob; and
6 securing the first fiber between the first and second knob portions.

1 30. The method of claim 29 further including affixing the first and second fibers to the
2 capillary opening after the first and second fibers have been positioned in the selected
3 polarization.

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